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Institutional Trades and Intra-Day Stock Price Behavior

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Abstract

This paper examines the effects of institutional trading on stock prices, using a unique data set. This data set records all transactions, both small and large, made by 37 large institutional money management firms. The direction of each trade, as well as the identity of the manager behind each trade, are identified. Analysis of the price impact of institutional trades sheds light on the elasticity of the demand for stocks, and on the magnitude of the cost of executing transactions. While our findings indicate that institutional purchases and sales of a stock are associated with some pressure on prices, the magnitude of the price impact is much smaller than in previous research. We also document a marked asymmetry between the price impact of buys versus sells, and provide several conjectures as to their underlying differences. While the market impact of a trade is related to market capitalization and relative trade size, their importance pales in comparison to the influence of the money manager who is behind the trade.

Trading on equity markets has become increasingly dominated by institutional investors. It has been estimated that in 1989 about seventy percent of trading volume on the New York Stock Exchange is accounted for by member firms and institutional investors (Schwartz and Shapiro (1990)). In light of their importance, the impact of institutional trading on stock prices has been the subject of increased attention. It has been suggested, for example, that the increased concentration of trading into institutional hands may be potentially destabilizing by increasing intra-day price volatility (Report for the New York Stock Exchange's Panel on Market Volatility and Investor Confidence, 1990; Schwartz 1991).

The responsiveness of prices to buying or selling pressure depends, in general, upon the features of the market mechanism whereby trades are carried out. These features include, amongst other things, whether trading occurs in a continuous auction or periodic call market, whether orders are submitted as market or limit orders, and whether orders are handled by a designated specialist or by competitive market-makers. Markets with mechanisms which facilitate the provision of liquidity will, other things equal, exhibit less price volatility in response to order imbalances (Harris (1990)). Hence, an evaluation of the market impact of institutional trades is of concern to policymakers, researchers and exchange officials.

It is also of great interest to institutional investors themselves to evaluate the market impact of their own trades. Researchers,in evaluating the profitability of various trading rules also find it necessary to measure the costs of trading. Numerous studies document the inability of portfolio managers to out-perform various passive benchmarks, despite the considerable effort to analyze and select stocks (Brinson, Singer and Beebower (1991), Fama (1991)). This "implementation shortfall" may be due to the costliness of actually executing trades (Perold (1988)). The adjustment of stock prices to buying or selling pressure constitutes one form of trading cost. High trading costs from demanding immediacy, for example, may offset the benefits of advance information or a trading rule, yielding inferior performance. Indeed, the heavy expenditure of resources by institutions on trading facilities, personnel and computerized trading systems suggests that the execution costs of institutional trades might not be negligible and, moreover, that they are potentially controllable (Schwartz and Whitcomb (1988), Bodurtha and Quinn (1990)). Such costs are likely to vary across managers with different investment or trading styles, and depend upon the size or difficulty of the transaction.

Academic interest in the effects of institutional trading has focussed on block trades (Kraus and Stoll (1972), Holthausen, Leftwich and Mayers (1987, 1990), Ball and Finn (1989)). These studies compare the price at which a large block transaction is executed either with the prices of adjacent transactions in the same stock, or with closing prices. In a frictionless market with no information effects, the market price should not be affected by trades. Any impact of trades on prices is thus consistent with the presence of new information conveyed by large transactions (Kyle (1985), Easley and

O'Hara (1987)), or with the existence of various kinds of market frictions. Such frictions might reflect the existence of different forms of liquidity costs, including the costs of processing orders (Demsetz (1968)) or compensation for inventory imbalances (Amihud and Mendelson (1980), Ho and Stoll (1981). Alternatively the market price of a stock may be affected by shifts in excess demand because investors may not recognize the existence of close substitutes for an individual stock. Measuring the impact of institutional trades on prices thus allows an evaluation of the importance of these different effects on the flow demand/supply schedules for stocks.

This paper examines the effects of institutional trading on stock prices, using a unique data set. This data set reports all transactions made by a sample of 37 large institutional money management firms over the course of two and a half years. Each transaction is explicitly identified as a purchase or sale by the manager in question; the money manager associated with each trade is also identified. Their trades number more than a million transactions, both small and large, involving issues listed on the New York and American Stock Exchanges. In all, about 5 percent of the dollar value traded on these two exchanges is accounted for. The impact of institutional trades is evaluated by comparing the price at which the transaction is executed with a variety of benchmark price measures on the date of the trade. Tracking the intra-day behavior of prices around institutional trades allows an evaluation of their price impact of institutional trades and aids in disentangling alternative explanations for the sources of such market impact.

The distinctive features of our data set permit several fresh new insights on the price impact of institutional trades in general. Our findings suggest that both institutional purchases and sales are accompanied by some price pressure relative to the opening price on the trade date. However, there is a marked asymmetry between the behavior of prices after purchases and after sales. Subsequent to buys, the stock price continues to appreciate, while the price almost fully recovers after sales to its prior level: as a result, the principal-weighted average price change from the open to the close on the trade day for buys is 0.34 percent, while the corresponding average price change for sells is -0.04 percent. This asymmetry is intriguing, and we provide several conjectures as to its underlying source, related to the effects of short-run liquidity costs, imperfect substitution between stocks, information effects and money managers' behavior. The price impact of buy and sell transactions is related to the market capitalization of the stock, and to the relative difficulty of the trade (measured as the principal value relative to normal daily trading volume in the stock). A much more dominant influence on the trade's price impact, however, is the identity of the money manager who is behind the trade: our results suggest considerable differences across money managers with respect to their execution ability.

While our findings indicate that institutional trades are associated with some impact on stock prices, the magnitude of the effect pales in comparison to the figures reported by previous authors.

Kraus and Stoll (1972), for example, find that the permanent price change using closing prices for buys is 1.41%, while our findings suggest that the open-to-close average price change for buys is only 0.34 percent. The low magnitude of the price impact also has strong implications for the much-debated issue of the market impact cost of executing trades. A manager who gives up only an eighth of a point each way would incur a round-trip cost of 0.68 percent on a typical stock. In contrast, we are hard-pressed to find a round-trip market impact cost, in the aggregate over all trades, exceeding 0.36 percent. The modest estimates of market impact costs attest to the keenly competitive nature of the money management industry.

The remainder of the paper is organized as follows. Section I provides a review of the literature and outlines alternative explanations for the price impact of trades. Section II describes the data and presents summary statistics on the characteristics of institutional trades. The empirical results are described in section III. Section IV relates our results on the price impact of trades to the question of measuring the costs of executing trades. A final section provides the conclusions.

I. Literature Review

Several studies have explored the behavior of stock prices around large trades. These studies in general focussed on block trades (trades over 10,000 shares) and used the tick test to classify trades as buyer or seller initiated. Block trades at a price below (above) the price prior to the block were considered to be seller (buyer) initiated. Zero tick trades were in general not classified.
Three potential explanations for price changes triggered by large trades have been suggested in the literature: (i) short run liquidity costs, (ii) imperfect substitution, and (iii) information effects.

Short run liquidity costs arise because of the difficulty in finding immediately willing buyers or sellers. This results in temporary buying or selling pressure that translates into a price concession. In many large trades, block traders provide some of the liquidity, and are compensated at least in part by a price concession. A timely return of prices following a trade to the prior equilibrium is consistent with this explanation.

Prices will also change around large trades if there are no perfect substitutes for a particular stock. Hence, a seller will face a downward sloping demand curve and a buyer an upward sloping supply curve. Thus, the seller in a large transaction will have to offer a discount to induce buyers to absorb the extra shares. Similarly, a premium has to be offered by the buyer in a large transaction. It stands to

reason that the slope of the demand and supply curves will depend on the length of the horizon, although this point has not been discussed in the literature. The imperfect substitution hypothesis is consistent with permanent price changes or much slower reversals following the trade, compared to the predictions of the short run liquidity hypothesis.

Permanent price changes caused by large trades are also expected if the trades convey private information which is impounded into the new equilibrium price subsequent to the trade. Informed sellers believe that the stock is overpriced, and informed buyers that the stock is underpriced. The information effect depends on the identity of the buyer or seller (informed versus uninformed) and in many studies the size of a transaction was used as a proxy for the information content of the trade.

Prior evidence on the price impact of block trades includes papers by Kraus and Stoll (1972), Holthausen, Leftwich, and Mayers (1987, 1990), and Ball and Finn (1989). Kraus and Stoll (1972) found that the block price for sells was substantially below the price prior to the block. However, subsequent to the block there was a price rise of .71 percent. Overall, they viewed their evidence for sells as supporting the short run liquidity hypothesis. For buys, Kraus and Stoll observed that the trade price was substantially above prior prices. However, in contrast to sells, the price increase seems to be permanent, a result consistent with the information hypothesis. The asymmetry between buys and sells was also noted by Holthausen, Leftwich, and Mayers (1987). Both papers also explored the association between price effects and the size of the block. In general, the association was found to be stronger for sells than for buys.

Holthausen, Leftwich, and Mayers (1990) obtained results that are somewhat different from those in their earlier paper and in Kraus and Stoll (1972). They found that there is a substantial permanent effect associated with block trades, not only for buyer initiated trades, but also for seller initiated trades. Moreover, the effect is related to the size of the transaction for both types of trades. Ball and Finn (1989) utilize data from the Sydney Stock Exchange (a non-dealer auction market) and found substantial permanent effects for buys and sells. They interpret their results as consistent with the information hypothesis.

All of the above studies relied on the tick test to classify trades as buys or sells. The accuracy of this procedure was explored by Holthausen, Leftwich, and Mayers (1987) who analyzed 104 trades that

were known to be buyer initiated. They found that the tick rule properly classified only 52.8 percent of the trades. A more recent paper by Lee and Ready (1991) points out the various problems associated with trade-classification rules that are based on prior prices and quote data. Our paper avoids the classification problem because we have an explicit buy/sell indicator for each transaction.

Other studies, such as Scholes (1972) and Mikkelson and Partch (1985) that examined secondary offerings, and Asquith and Mullins (1986) and Loderer, Cooney and Van Drunen (1991) that examined seasoned equity offerings, observed a price drop upon announcement. This price drop is consistent with information effects or downward sloping demand curves. The paper by Loderer, Cooney, and Drunen (1991) makes a special effort to distinguish between the two possible effects. They show that adverse information cannot account for the drop in price, and conclude that the observed price changes reflect downward sloping demand curves. In a somewhat different context, Harris and Gurel (1986) and Shleifer (1986) investigate the price behavior of stocks upon their addition to the Standard and Poor's 500 Index. Both studies find substantial positive abnormal returns at the announcement date of the event. Their findings are consistent with downward sloping demand curves, at least over short horizons.

II. Transaction Data

This study utilizes a unique data set which contains transactions made by 37 large money management firms. The period covered is two and a half years, from July 1986 until the end of 1988. The data set identifies each transaction as a purchase or a sale, as well as the identity of the money manager behind each of the trades. This enables us to conduct a comparison across money managers. Such a comparison can shed some light on the determinants of execution costs. The data do not contain a time stamp and hence we cannot identify the prices immediately before and after the trade. However, to understand how trades are being executed, what is relevant in many cases is not what happened prior to the trade, but the market conditions when the decision to trade was actually made by the portfolio manager (which could be a considerable amount of time earlier than the trade). Such information of course is not in general available.

Table I provides some description of our sample. We analyze a total of 1,233,387 transactions and a dollar value traded of 387.6 billion dollars. This is a very large data base when compared to

previous studies in this area, and accounts for about 5 percent of the dollar value traded on NYSE and AMEX. Consistent with a recent paper by Lakonishok, Shleifer, Vishny, and Thaler (1991), most of the trading activity of institutions is in the largest stocks. The top decile by market capitalization accounts for 48 percent of the trades and 61 percent of the dollar value traded. In contrast, the bottom 40 percent of the stocks by market capitalization account for 3.7 percent of the trades and only 0.6 percent of the dollar value traded.

Previous studies, to capture institutional transactions, focused on trades that exceed 10,000 shares. Our results indicate that many of the institutional trades are actually quite small. Table II presents the distribution of various trade statistics for buys and sells. The results in Panel A are for the number of shares per trade. The average number of shares per trade is only 8400 for buys and 9100 for sells, and the medians are 2400 and 2700 for buys and sells, respectively. Moreover, 25 percent of the trades involve less than 1000 shares, and only about 20 percent of the trades involve more than 10,000 shares. The surprisingly small size of a typical trade is not caused by our sample composition. If anything, our data comes from large money managers which are expected to be involved in larger trades. The small trade sizes relative to typical holdings are consistent with managers trading in such a way as to reduce the influence of: (1) short run liquidity costs, or (2) information effects which are related to the transaction size.

Previous studies have also found that the number of blocks traded on a downtick substantially exceeds the number of blocks traded on an uptick. One explanation for the phenomenon is that it is easier to sell large amounts than to buy large amounts. Therefore, we expect to find that the sells are larger than the corresponding purchases. This is indeed the case, although the differences are quite small. For example, in the largest stocks, the mean number of shares traded is 8700 and 8200 for buys and sells, respectively.[1]

Panel B (Table II) presents the distribution of the dollar value of trades. The median trade is less than $100,000 and only about 6 percent of the trades exceed $1,000,000. As the company size increases, the trade gets large. In Panel C, we report the distribution of trade size relative to normal daily trading volume, the median is only 2 percent indicating that a typical institutional trade is not a major event. However, as the size of the companies decreases, the typical institutional trade becomes a

more significant event. For example, the median for buys is 0.24 in group 1, relative to 0.01 in group 4. The largest 1 percent of trades are many times larger than the typical daily volume in small stocks, whereas in the largest stocks such trades are typically less than 40 percent of the daily volume. Many studies focused on trades which were larger than the typical trading volume. Our results indicate that such trades are very uncommon at least in the more liquid stocks where most of the institutional holdings are concentrated.

III. Empirical Results

1. The Price Impact of Institutional Purchases and Sales

Table 3 summarizes the price impact of institutional purchases (panel (a)) and institutional sales (panel (b)), together with the percentage commission cost. For each transaction, the percentage return is calculated from the day's opening price to the trade, and from the trade to the closing price; the price change from the opening to the closing is also reported. These correspond, respectively, to the total, temporary and permanent price effects discussed in Holthausen et al. (1987). Further, to determine whether a typical institutional trade is fundamentally distinguishable from other trades, we compare the transaction price in a stock to three intra-day average prices: the volume-weighted average of all transaction prices in the same stock on the trade date; the volume-weighted average obtained when the trade under consideration is excluded, and the simple average of all transaction prices in the same stock on the trade date. In the subsequent discussion, we focus on the principal-weighted average of each price impact measure. This follows the norm in the investment industry, and permits evaluation of the overall dollar amount of the price impact. Prices for institutional purchases are, on a principal-weighted average basis, 0.22 percent higher than the opening price on the trade date. This difference amounts to eight cents per share, less than one tick, on a stock with a price of $36.50 (the average price over our sample period).

Several factors could account for the price increase from the open to the trade. In part, the rise reflects the average daily upward drift in prices, although this component is small--the mean total percentage change from the open to the close on the Standard and Poor's Composite Index over this period is 0.06 percent. On the other hand, the increase is consistent with the short-run liquidity cost

hypothesis. The change from the opening to the trade may simply reflect an upward movement to the ask price for institutional purchases. Alternatively this price increase might reflect favorable information. A final interpretation of the price movement from the open to the trade recognizes that institutional money managers may be passively responding to changes in the stock price before initiating transactions. In particular, increases in the stock price from the opening (perhaps as a result of good news) may prompt institutions to begin to purchase.

Subsequent to the purchase, there is a further principal-weighted average price increase of 0.12 percent from the trade to the closing price. This post-trade behavior provides one basis for discriminating between the different accounts described above. The price continuation after the purchase is sharply at odds with the reversal predicted by the short-run liquidity hypothesis. On the other hand, the reversal may take place over a period of more than one trading day. A more gradual adjustment of prices after a trade is consistent with the hypothesis that individual stocks are imperfect substitutes. Permanent effects on prices are also predicted if new information is conveyed by trades. Another possibility is that the price pressure after the trade is a result of follow-up trades in the same stock. These additional trades might be initiated by the same manager as part of a larger trading program, or by other managers, to the extent that they engage in "herding" behavior.

For institutional purchases, the permanent principal-weighted price change from the open to the close is 0.34 percent. The simple mean price change is also very similar, at 0.26 percent. While this is much larger than the average open-to-close return of 0.06 percent for the Standard and Poor's Composite, it is nonetheless considerably smaller than previous estimates of the price impact of block purchases. Kraus and Stoll (1972) found that the price for buy blocks is on average 0.75 percent higher than the prior price (1.50% higher than the previous closing price), followed by a decline of 0.09 percent to the day's closing price. Holthausen et al. (1990) report that the return from the price prior to the block to the trade price is 1.18 percent, which is subsequently reversed by a decline of 0.13 percent to yield a permanent price change of 1.05 percent. These studies, however, focussed only on large block transactions. In addition, their reliance on the tick test to infer trade direction results in the exclusion of blocks associated with zero price ticks. It is also quite probable that the remaining transactions (those associated with an up- or down tick) represent trades initiated by relatively less patient investors (i.e.

those willing to pay a larger price concession in exchange for greater immediacy). In this respect, the average price impact is likely to be larger in the case of purchases or sales selected on the basis of a non-zero tick, compared to purchases or sales in general (whether initiated by the investor or not). It is thus not surprising that larger price effects are documented in the earlier papers.[2]

Both the principal-weighted and simple mean price impacts may be influenced by large, unrepresentative transactions. Accordingly, Table 3 also reports the median and other percentiles for each measure of price impact. Relative to the open or the close, the median return for buys is zero while the median change from open to close for buys is also zero. Evidently, the typical institutional purchase has little or no impact on prices. However, the percentiles of the distribution of returns indicate that there is substantial dispersion across trades with respect to their price impact, suggesting that other factors may be at work as well.

Another perspective on the price impact of institutional orders is obtained by comparing the trade price to an average of transaction prices from the same day. Berkowitz, Logue and Noser (1988) interpret the price impact relative to the volume-weighted average price as a measure of execution cost. Using this benchmark, the dollar-weighted average impact is very small, at 0.02 percent. Similar values are obtained if the calculation of the volume-weighted price excludes the trade under consideration, or if the simple average price is used as the benchmark.[3] The median percentage difference under any of the three intra-day average price benchmarks suggests that the typical institutional purchase can be accommodated with virtually no market impact. Indeed, the simple average impact relative to these benchmarks is slightly negative, which would imply, under the interpretation of Berkowitz, Logue and Noser (1988), a negative execution cost on average to buying!

Turning to institutional sales (panel (b) of Table 3), there is an initial principal-weighted average drop in prices of 0.14 percent from the open to the trade. As in the case for buys, many of the same factors can account for this change--a movement from the open down to a bid price, leakage of unfavorable information or institutional sales may be triggered by price changes beforehand. In marked contrast to the behavior of prices after buys, however, the initial price decline is almost fully reversed by the subsequent average return of 0.10 percent to the close. As a result, there is only a small permanent

change of -0.04 percent. The post-trade behavior of prices in the case of sells is thus more supportive of effects due to short-term liquidity costs, rather than imperfect substitution or information.

The results in Table 3(b) are reminiscent of the findings in Kraus and Stoll (1972) and Holthausen et al (1990). In comparison to these earlier studies, however, both the principal-weighted and simple mean percentage returns in panel (b) of Table 3 are much smaller, and the median impact relative to either the open or close is zero. Furthermore, the prices at which institutional trades are executed do not differ greatly from the average price over the course of the day. The principal-weighted average percentage differences range from -0.07 percent using the volume-weighted average price, to -0.10 percent using the simple average price as the benchmark. Overall, the evidence suggests that institutional sales are associated with some downward pressure on prices, although the market impact is generally small and temporary in nature.

It might be argued that the differences between the findings in Table 3 and the findings of earlier research are due to differences in commission rates. If the specialist or block trader on the other side of the trade receives compensation in the form of a commission as well as a price concession, then a lower concession might be exchanged for a higher commission. Similarly, differences between the commission rates for purchases and sales might account for the differential price impact. In Table 3, however, the principal-weighted commission rate is the same for buys and sells, at 0.17 percent of trade value (six cents per share on a stock with the average price of $36.50). Furthermore, the simple average commission rate, 0.23 percent, is much smaller than the mean commission rate of 1.01 percent for the largest stocks over the period 1960 to 1979, reported by Stoll and Whaley (1983).

2. The Asymmetric Response of Prices to Purchases and Sales

A key puzzle emerges from Table 3: there is a marked asymmetry between the effect of institutional buying and selling activity on stock prices. Figure 1 plots the principal-weighted return from the open to the trade, and from the trade to the close.[4] Purchases of a stock are accompanied by an increase in its price, which continues to rise after the trade; sales of a stock are accompanied by a drop in its price, but there is subsequently an almost complete recovery in the price.

Several conjectures can be offered to account for the asymmetry between the price impact of buys and sells. The larger, positive impact of institutional purchases could arise if institutions are

positive feedback traders for buys but not for sells, i.e., they tend to intensify their buying behavior on days when the market rises. This explanation, however, is not compatible with the data. On days when there is buying activity, the average return from the open to the close on the Standard & Poor's Composite Index, weighted by the dollar value of purchases, is 0.05 percent. The corresponding principal-weighted return for days when there is selling activity is actually higher at 0.08 percent. If anything, this finding suggests that institutional money managers might make markets more stable by their negative feedback strategies.

Several other factors, not mutually exclusive, might account for the differences between the effects of buying and selling activity. "Street wisdom" suggests that brokers are willing to accommodate customers' sales by purchasing shares and holding them in inventory. In exchange, sellers pay a short-term liquidity cost in the form of a price concession to the broker. On the other hand, brokers are more reluctant to accommodate customers' purchases by undertaking short positions. Instead, an institution who wishes to purchase shares will generally have to deal directly with existing holders of the stock. Since an intermediary is less likely to be involved in purchases, it is less likely that the transaction price incorporates a fee to the intermediary in the form of a temporary price concession.[5]

Information effects are also more probable for purchases than for sales. Substantially more attention is devoted within the securities industry to generating buy recommendations than sell recommendations (Lakonishok and Maberly (1990)). A money manager who chooses to act on a buy recommendation will generally have to reallocate funds in the portfolio away from other stocks. Since an institutional investor typically does not hold the market portfolio, the choice of a particular issue to sell, out of the limited alternatives in a portfolio, does not necessarily convey negative information. Rather, the stocks which are sold may already have met the portfolio's objectives, or there may be other mechanical rules, unrelated to expectations about future performance, for reducing a position. As a result, there are many liquidity-motivated reasons to dispose of a stock. In contrast, the choice of one specific issue to buy, out of the numerous possibilities on the market, is likely to convey favorable firm-specific news. Under this interpretation, the asymmetric impact of buys versus sells can be attributed to their different information content, at least on average.[6]

Conversations with money managers suggest another behavioral interpretation of the differences between the effects of buys and sells. Most managers target for inclusion in their portfolios stocks that they believe are undervalued at current prices. A slight increase in the price of such a stock might engender fears that the stock will "run away" from the manager. Hence the price increase will not deter the manager from buying the stock, perhaps contributing further price pressure. On the other hand such a manager displays more patience in selling; if the stock price falls, the manager is likely to defer selling activity, feeling that the price will ultimately rebound to its higher true value.

In summary, the price impact of sales is not merely the reverse of the impact of purchases. While the behavior of the stock price after buys reflects new information or inelastic excess demand curves, the price behavior after sells is more indicative of a liquidity-related reversal. In any case, the average and median price effects are not large, and execution prices for institutional trades do not differ very much from average prices over the course of the day.

3. The Role of Firm Size

Prior research, both theoretical and empirical, suggests that the price impact of a trade is affected by various other considerations. In light of the numerous proposals for trading rules based on low capitalization stocks, the price impact of trades in small stocks is of special interest. Loeb (1983), Stoll and Whaley (1983) report that dealer spreads and commission costs are higher for smaller firms than for large firms. In Table 4, results are presented for trades classified into four categories according to the market capitalization of the stock. The cut-off points for each category are determined every quarter, by ranking all NYSE and AMEX firms on the CRSP tape in terms of the market value of equity outstanding at the end of the prior quarter. The group of smallest firms comprises the first 40 percent of firms ranked in this manner; the second group comprises the next 40 percent; the third group comprises firms in the ninth decile while the final group is made up of firms in the top decile of the distribution.

In the case of buys (Table 4A), price effects relative to the open and close indeed vary with the market value of equity. With the exception of the category of smallest firms, the return from the open rises monotonically as firm size declines. Subsequent to the trade, price continuations are stronger after

purchases of smaller stocks. Taken together, the average price change from open to close on days with institutional purchases is positive and tends to be higher for smaller firms. The principal-weighted average permanent open-to-close return ranges from 0.28 percent for the largest firms to 0.49 for the smallest. For sell orders (Table 4B), the principal-weighted average drop from the opening price to the execution price also tends to be larger, the smaller the firm. However, the subsequent recovery in the price is also stronger for smaller firms. As a result, there is no clear pattern across the four size groups with respect to the permanent price change--the price remains roughly unchanged or declines slightly from the open to the close.

It is evident from Tables 4A and 4B that the asymmetry between the price impact of buys and sells persists across different firm sizes. It is probably more difficult to maintain anonymity in trading low capitalization stocks, since institutional participation in such stocks is generally quite low. Accordingly, the market might interpret institutional purchases of smaller stocks as more reliable indicators of favorable private information. Moreover, even a minor institutional stake in a small stock might involve several successive trades, so that the market impact of an institutional purchase might be spread out over several days, before a reversal occurs. Limited institutional holdings of smaller stocks might also reduce the extent of arbitrage activity in these stocks. As a result, disruptions in demand are less likely to be accommodated by additional supply from institutional arbitrageurs, resulting instead in longer lasting price pressure. Sales by our sample of institutional money managers, on the other hand, do not on average convey much new information to the market, even for the smallest stocks. Such sales might represent money managers removing poorly performing small stocks from their portfolios in order to avoid potentially embarrassing questions from their clients ("window dressing"). Investment policies regarding minimum levels of market capitalization, dividend yield, or the number of analysts following a stock, may prompt a manager to sell stocks even in the absence of unfavorable information.

In all the four size groups, the average price impact for buys and sells is small, particularly in light of the lower prices of small stocks. The median return relative to either the open or close is zero for buy and sell orders carried out by institutions. In comparison to the three intra-day average price benchmarks, institutional sales are associated with a slight downward pressure on prices. Contrary to intuition, however, execution prices for buys do not differ by much from the average price benchmarks

and do not move with firm size in the expected direction. If anything, purchases of the smallest stocks are carried out at prices more favorable than the intra-day average price. For the smallest firms, the magnitude of the price impact of both buys and sells is sensitive to whether the trade is included in, or excluded from, the volume-weighted average. Turning to commissions, although the percentage commission cost falls with firm size, the dollar cost is almost the same across all size groups at about six cents per share. The low magnitude of the numbers in Tables 4A and 4B stand in distinct contrast to the estimates of Stoll and Whaley (1983), who report a simple mean for the quoted relative spread of 2 percent and a simple mean commission rate of 1.6 percent applicable for the smallest four deciles of firm size.

One reason for the difference between the quoted spread reported by Stoll and Whaley (1983) and the realized market impact of a trade (other than the different sample period) might be opportunistic or strategic trading behavior on the part of institutional money managers. In particular, the results for institutional purchases of the smallest stocks may be confounded by cross-sectional differences in institutional trading strategies. Institutions that predominately trade in low capitalization stocks may choose to buy only if a favorable, inexpensive opportunity presents itself (perhaps because the quoted spreads and commissions are indeed high). In this latter case, purchases of lower capitalization stocks may tend to be concentrated in a relatively small group of money managers, who appear to incur low market impact costs because their buying behavior essentially supplies liquidity to sellers. Sellers of small stocks, on the other hand, are more likely to come from a larger, more diffuse group of institutions, including institutions selling stocks whose market values have declined in past periods. On average, such sellers incur short-run liquidity costs which are larger for small firms.

4. The Role of Trade Difficulty

The comparative difficulty of a trade is another potential determinant of its impact on the stock price. A commonly used indicator of trade complexity is the dollar value of the trade relative to normal daily volume in the stock. A trade that is large in comparison with normal trading volume would be more difficult to execute without incurring a large market impact, either because a larger concession is necessary to attract immediately willing counterparties or because a large trade is a stronger signal of private information. Models of informational asymmetry such as Easley and O'Hara (1987), Glosten

(1989) suggest this latter reason. Tables 5A and 5B analyze the association between the price impact of a trade and its complexity (relative size). The complexity of a transaction is defined as its principal value, relative to average daily trading volume over a prior 40 day period (normal volume). On the basis of relative size, trades are classified into one of four groups: trades accounting for more than 80 percent of normal volume are categorized as the hardest trades; trades between 40 percent and 80 percent of normal volume are placed in group 4; trades between 25 percent and 40 percent are placed in group 3; trades between 10 percent and 25 percent of normal volume are placed in group 2 while trades which are less than 10 percent of normal volume are classified as the easiest trades. These cut-off points were chosen after extensive conversations with trading professionals and money managers as to what constitutes a difficult trade.

The results in Table 5 are very similar to the results obtained earlier, when trades are classified by firm size. In particular, the principal-weighted average permanent price change for purchases is monotonically increasing in trade complexity, rising to 0.51 percent for the hardest trades. The permanent price change for institutional sales is, on average, negative for all but the easiest trades, and is larger (in absolute value) for more difficult trades. Even in the category of the hardest trades, however, the average permanent impact is not particularly noteworthy: a sale which accounts for as much as 80 percent or more of normal daily volume yields an average permanent price change of only -0.15 percent, so that by the end of the day the stock price is only about four cents below its opening price (given an average price of $25.9 per share for the hardest trades). These results for the open-to-close price change confirm an association with trade size for buys, although the magnitude of the permanent impact for both buys and sells is smaller than in Holthausen et al (1990).

Table 6 examines the behavior of the price impact of trades as both firm size and trade complexity vary. Within each of the four categories of firm size (defined as in Table 1), trades are divided into four groups by trade difficulty, using the quartiles of the distribution of trade size relative to normal daily volume (as reported in Table 2, panel c). In order to avoid clutter, the table reports only the principal-weighted averages for a subset of the price impact measures.

For institutional purchases, the permanent impact on prices ranges from 0.11 percent for the easiest trades in the largest firms to 0.72 percent for the hardest trades in the smallest firms. The

impact of even the hardest purchases of the smallest stocks is not particularly large, however, compared to other researchers' estimates of the cost of trading small stocks in general. At the other end of the scale of firm size, the permanent effect of institutional purchases of the largest stocks (where most institutional trading is concentrated) tends to increase with trade difficulty; at its maximum, however, this impact amounts to only 0.33 percent. The average permanent impact of institutional sales is, in general, also not very noticeable. When the volume-weighted price is used as the benchmark, the price impact provides very little basis for discriminating between trades with different characteristics: the average impact of the easiest purchases in the largest stocks is -0.02 percent, while the average impact of the hardest purchases of the smallest stocks is even more favorable at -0.08 percent.

All in all, the results for buys in Table 6 are consistent with the presence of information effects or downward sloping demand curves due to imperfect substitution. Strategic buying behavior on the part of money managers may help to account for the relatively low impact from the open in the case of the smallest firms. Similarly, the ability of managers to cloak the information content of their purchases can perhaps help to account for the absence of any strong correlation between the permanent price effect and relative trade size. On the other hand, sell transactions are associated with only minor permanent price changes. Any initial downward pressure on prices is generally reversed by the end of the trading day, suggesting the existence of short-term liquidity costs.

5. Differences in Price Impact Across Money Managers

It may also be the case that the market impact of a transaction varies with the style of the money manager and the competence of the trading desk responsible for the trade. Models of adverse selection, for example, stress the difference between informed and uninformed mangers. In either case, other strategic aspects of the trade, such as its size and timing, are subject to the influence of the individual trader. Treynor (1981), Wagner (1989) describe how trading strategies might differ with respect to demand for immediacy, whether the manager follows a positive feedback or negative feedback strategy, as well as other less tangible factors. Admati and Pfleiderer (1989) show how the interaction between the strategic trading behavior of informed speculators and discretionary liquidity traders can account for intraday price patterns. Lakonishok, Shleifer and Vishny (1991) argue that money managers with different trading strategies might offset one another's price impact, so that their aggregate

influence is not necessarily destabilizing. Variation across managers in terms of their strategic behavior and investment in a trading desk should give rise to differences across managers with respect to the price impact of their purchases and sales.

An extended characterization of the various trading strategies adopted by different money managers, together with their resulting impact on stock prices, is beyond the scope of this paper (see Lakonishok, Shleifer and Vishny (1991)). Instead, in the subsequent analysis, we adopt the less ambitious tack of only documenting the existence of dispersion across money managers with respect to the price impact of their trades. In Table 7, summary statistics are presented for the distribution across managers of three of our measures of price impact. For each of the 37 individual managers, the different returns are calculated and then averaged (using trade principal as weights) across all the manager's trades. The summary statistics in Table 7 are based on these 37 observations for each price impact measure.

The performance of the median manager parallels our previous findings from Table 3. Nonetheless, considerable variation exists across managers for both buys and sells under each measure of price impact. This variation cannot be attributed simply to noise - the average price impact of each manager is based upon tens of thousands of trades, so that the precision of each estimate is high. For example, the execution performance for buys relative to the opening price varies from -0.46 percent in the tenth percentile to 0.54 percent in the ninetieth percentile, yielding a difference of a full percentage point per transaction. The corresponding difference for sells is very similar, at 0.98 percent per transaction. Insofar as the opening price is known if and when a manager chooses to trade, the differences across managers in their execution performance relative to the open reflects several sources: their differential skill in seeking out liquidity; ability in trading before the release of information; as well as differences in their responses to price movements subsequent to the opening. The dispersion across managers, in terms of the post-trade return till the close, is also notable but substantially lower . For buys (sells), the tenth percentile is -0.01 percent (0.01 percent) and the ninetieth percentile is 0.25 percent (0.26 percent), giving rise to a difference of 0.26 percent (0.27 percent) per transaction. Given that the manager has already traded, the post-trade return will vary across managers only to the extent that the market price responds differently to their trades In this respect, the dispersion in

managers' post-trade returns is expected to be smaller than the dispersion in their pre-trade execution performance.

Our confidence that the differences across managers can be ascribed to differences in trading strategy, rather than noise, would be heightened if a manager who obtains favorable execution for buys also fares well for sells. This is indeed the case: the rank correlation across managers between performance for buys and sells relative to the opening price is -0.84, -0.10 for performance relative to the closing price and -0.74 for the permanent price change. In other words, a manager who buys low relative to the opening price (or relative to the closing price) also tends to sell high relative to the opening price (or relative to the closing price). These findings are consistent with the price impact of buys and sells being influenced by a common variable such as a manager's execution ability.

6. Regression Results

Following the lead of previous theoretical and empirical research, the previous sections confirm the influence of firm size and trade difficulty on the price impact of a trade. In addition, the unique features of our dataset enable us to suggest another potential influence, namely the identity of the manager behind each trade. It is thus natural to ask whether, after controlling for firm size and trade difficulty, the manager's identity still remains as an important determinant of a trade's price impact. There may also be a trade-off between the commission cost and the market impact of the trade. These various influences are accommodated in the following regression model:

$$r_i = \alpha + \beta c_i + \sum_{j=1}^{3} \delta_j S_{ij} + \sum_{j=1}^{4} \gamma_j D_{ij} + \sum_{j=1}^{36} \varphi_j M_{ij} + \varepsilon_i \qquad (1)$$

For each trade i, r_i is one of the three measures of price impact that we focus on: the percentage return from the open to the trade, from the trade to the close, and from the open to the close. The commission cost for the ith trade is denoted by c_i, and following the common practice in the investment industry, is measured in cents per share (Marshall, 1988). It is more likely that the manager's trading desk perceives the trade-off (if any exists) in terms of the dollar commission cost, rather than in terms of the commission rate.[7] The effects of market capitalization, trade difficulty and managerial strategy are

captured by the dummy variables, S_{ij}, D_{ij} and M_{ij}, respectively. For example, M_{ij} takes the value of one if the ith trade is executed by the jth manager and is zero otherwise. To permit identification, the coefficients for the dummy variables for managers are normalized relative to the first manager in the data set. Similarly, the coefficients for the trade difficulty variables are expressed relative to the impact of trades in the first category (the easiest trades), while the coefficients for firm size are expressed relative to the impact of trades in the largest firms. Separate regressions are fit to the price impact of buy transactions, and to the impact of sell transactions. In addition, the marginal explanatory power of each set of dummy variables is assessed by excluding each set, one at a time, from the full model (1).

Panel A of Table 8 reports the adjusted R^2 for each specification of the regression model. For a given measure of price impact, a comparison of the different specifications indicates that most of the explanatory power of the model comes from the identity of the individual money manager behind the trade. In contrast, excluding the dummy variables for firm size and trade complexity has little or no effect on the R^2. In light of the importance of the manager dummies, it is perhaps not surprising that the model provides the best fit in the equation for the return from the open to the trade. This measure of price impact, to a larger extent than the others reflects the effects of managerial trading strategy.

In panel B, the coefficients of the full model are reported for each of the three measures of price impact. Given the very large sample size nearly all of the estimated coefficients are large relative to their standard errors. Therefore, the focus of the discussion will be on the economic significance of the coefficients.

One presumption is that favorable execution (lower price impact) is purchased from a broker in exchange for a higher commission fee. However, the coefficient for the commission cost variable for both buys and for sells (in parentheses) is negligible, regardless of the measure of price impact, and in many cases has the wrong sign. The most favorable evidence on substitution between the price impact of a trade and its commission cost emerges in the equation for the price impact of sells relative to the closing price. Even in this case, however, an increase in the commission of one cent per share (in itself a large jump in commissions) lowers the post-trade price reversal by 0.007 percent, yielding a dollar savings of only 0.3 cents per share on a stock with the average price of $36.50. As pointed out in Beebower (1989), however, the lack of a relation between commission payments and price impact does not imply that the

compensation to the broker is independent of the services provided to the manager. Some brokers, for example, may commit their own capital to accommodate managers' trades, while others may simply process transactions. While the commission payments to these two groups may not differ greatly, the manager may instead direct easier trades in large stocks to the second group, receiving in exchange "soft-dollar" rebates in the form of brokers' research services or brokers' assumption of some of the client's expenses. Such rebates are less likely in the case of brokers with more extensive investments in execution capability.

With respect to the influence of firm size and complexity, the results in panel B confirm the findings of the previous sections. What is particularly noteworthy, however, is that the coefficients of the dummy variables for money managers still display considerable dispersion--for buys the spread between the tenth and ninetieth percentiles runs from 0.26 when returns are measured after the trade to 0.72 when pre-trade returns are considered. Similarly, money managers' execution performance for sells can differ greatly--the spread between the tenth and ninetieth percentiles of the coefficients for the manager dummies ranges from 0.34 (relative to the closing price) to 0.87 (relative to the permanent impact). While somewhat attenuated relative to the findings of table 7, these spreads are still considerable.

IV. The Execution Cost of Institutional Trades

The results of the previous section on the price impact of institutional transactions also provide evidence on the costs to institutional investors for executing equity trades. In particular, the difference between the price at which an order is executed and the underlying true value of the stock amounts to a price concession which is a cost of trading, in addition to brokerage commissions. Within the investment industry, considerable resources, in the form of salaries for professional traders and the costs of computers and communications equipment, are expended on monitoring and controlling such trading costs. Further, researchers who wish to evaluate the profitability of different trading rules must grapple with the costs of transacting under such rules. Nonetheless, there is remarkably little agreement as to the magnitude of execution costs. Several authors, using a variety of different methodologies and samples, have reported estimates of trading costs. Demsetz (1968) reports a total cost (spread plus commission) of 1.3 percent; Condon (1981) finds average execution and commission costs of 0.55 percent

and 0.32 percent, respectively; Stoll and Whaley (1983) document average spreads of 0.69 percent for the largest stocks (2.93% for the smallest) and commissions of 1.01 percent (1.92%); Loeb (1983) reports round-trip costs between 1 and 8 percent for the largest stocks; Stoll (1991) using data on aggregate revenues for the securities industry, finds that market impact and commission costs over the 1980s averaged 0.11 percent and 0.45 percent, respectively, on exchange-listed stocks.

Much of the disagreement stems from the difficulty of specifying a benchmark price.[8] An obvious candidate is the closing price of the stock on the trade date; another is its opening price. Alternatively, some intra-day average of transaction prices (such as the volume-weighted average price) can be used. In this sense, the temporary and total price impact of institutional trades, and the impact relative to various intra-day averages, reported in the previous section, yield average execution costs for purchases and sales. In Table 3, average round-trip costs include commissions which are 0.34 percent of trade value, and market impact costs; these range from 0.09 percent relative to the volume-weighted price to 0.36 percent relative to the opening price. When the closing price is used as the benchmark, the cost of sells is roughly offset, on average, by a benefit for buys, since there is a post-purchase average price continuation. Further, when the estimates of trading cost are disaggregated by market capitalization and trade complexity, the average market impact costs are smaller than the corresponding figures in Loeb (1983) or Stoll and Whaley (1983). In addition, the costs relative to the open tend to move with market capitalization and trade complexity in the expected direction. Costs relative to the volume-weighted price, however, display very little variation across trades in large and small stocks, or across difficult and easy trades.

The various measures of execution cost are, nonetheless, not without shortcomings. The opening price may not be a relevant benchmark price if the order is not given to the trader for execution before trading begins. To one degree or another, each cost measure can be manipulated by gaming behavior on the part of managers who are being evaluated. A manager can postpone trading until close to the end of the trading day and then choose to execute only those transactions whose prices are better than the open or the intra-day average price; the remaining orders are deferred indefinitely. Similarly, a manager who carries out a large transaction will have a major influence on the volume-weighted price, distorting the cost calculation--for example, in Tables 4A and 4B, the cost of buys (sells) in the category of the smallest

firms is -0.08 percent (0.12%) relative to the volume-weighted average price; when the trade itself is excluded from the benchmark, the cost is higher at -0.05 percent (0.35% for sells). None of these cost measures address the issue of opportunity cost (including the cost of unexecuted orders), or the potential adverse selection problem (the possibility that the manager may be "bagged" by buying cheaply a stock which subsequently experiences negative performance). It would thus seem advisable to consider a broad range of cost measures, rather than focussing on a single number, for purposes of evaluating execution performance.

V. Summary and Conclusion

The extent to which trades affect stock prices is of great interest to financial researchers and investment managers. Analysis of the price impact of institutional trades sheds light on the elasticity of the excess demand curve for stocks, and on the magnitude of the cost of executing transactions. Previous studies on the price impact of trades, however, have focussed on the effects of block trades and in some cases, have considered only the largest blocks. In these studies, moreover, the change in the transaction price itself is used to infer whether a trade is initiated by the buyer or by the seller. In contrast, our sample covers a more recent period and contains more than a million trades both large and small, by 37 large institutional money managers. Each trade is explicitly identified as a purchase or sale by the money manager, who is also identified.

The distinctive features of our data set enable us to generalize and extend previous studies on the price impact of block trades. Overall, the evidence suggests that institutional purchases and sales of a stock are associated with some pressure on prices, where the price impact is measured using a variety of benchmarks. Relative to the opening price on the trade date, for example, buy transactions are associated with a principal-weighted average price increase of 0.22 percent while sell transactions are associated with a principal-weighted average price decline of 0.14 percent. The behavior of prices from the open to the trade can be attributable to short-run liquidity costs, prior release of information or positive feedback trading behavior by managers.

The post-trade behavior of prices is more perplexing, and displays a sharp difference for buys as opposed to sells. Specifically, the price continues to rise after purchases - the principal-weighted average

return from the trade to the same-day closing price is 0.12 percent - while the price tends to correct itself after sales - the principal-weighted average return from the trade to the close in this case is 0.10 percent. The post-trade reversal for sells is consistent with the existence of short-run liquidity costs, while the post-purchase behavior of prices is consistent with information effects, or imperfectly elastic demand curves.

As in Kraus and Stoll (1972), Holthausen et al. (1987), we find that institutional purchases are associated with a principal-weighted permanent price change from the open to the close on the trade date of 0.34 percent, while there is only a very small permanent impact (-0.04 percent) from institutional sales. The difference between the price impact of buys and sells cannot be attributed to positive feedback trading. Rather, an analysis of the open-to-close price change on the Standard & Poor's Index provides some evidence that money managers might trade in a contrarian fashion.

Several conjectures are offered to account for the asymmetry between the price impact of buys versus sells. Institutional sales are more likely to involve an intermediary broker, compared to institutional purchases. Hence the price impact of sells is more likely to reflect a temporary discount as compensation for the intermediary. On the other hand, institutional purchases might be a stronger signal of favorable information, whereas there are many potential liquidity-motivated reasons to dispose of a stock. Finally, a manger who is reluctant to "miss the boat" will not be deterred from buying a stock if its price rises, while declines in the stock price may prompt a manager to defer selling. Much further research, however, is called for in accounting for the differences between the effects of buys and sells.

Considerable attention in previous research has focused on the effects of market capitalization and relative trade size as determinants of the market impact of a trade. We find that the market impact of a trade is indeed related to these influences, although its magnitude is considerably smaller than in previous work. For example, the principal-weighted average return from the open to the trade for the hardest trades in the smallest stocks is only 0.23 percent for buys and -0.57 for sells. Moreover in a multiple regression, we find that the importance of market capitalization and trade difficulty pales in comparison to the influence of the money manager who is behind the trade. Considerable differences are observed across managers with respect to the price impact of their trades.

The results on the price impact of institutional trades provide some insight on the much debated topic of the cost of executing trades. Our highest estimates of round-trip costs are obtained when the opening price is used as the benchmark. Even in this case, however, the round-trip market impact cost is only 0.36 percent, which is definitely on the low side of previous estimates. To put this cost estimate in perspective, suppose that each purchase or sale results in giving up only one tick, so that round-trip costs equal twenty-five cents. For a typical stock (price $36.50) the round-trip market impact cost should be in this case 0.68 percent; almost double our estimate. Given the competitiveness of the investment industry and the substantial resources expended on trading facilities, it should perhaps not come as a total surprise that money managers are loath to give up as much as an eighth every time that they execute a trade.

Footnotes

[1]If an institution sold (bought) a large number of shares (such as 50,000 shares), there might be more than one party on the other side of the trade. In our dataset, such a transaction would be reported as a single trade.

[2]Past studies of block trading use data from earlier periods (no later than 1983); dramatic changes have since occurred in equity markets. Relative to the early 1980s, the volume of trading has doubled while percentage commission costs are at half their former levels; alternative mechanisms such as off-floor trading on computerized networks have begun to compete with the specialist system; the emergence of options and futures markets have allowed institutional investors to hedge security risks, arguably allowing them to devote more attention to reducing market impact.

[3]We also replicated the analysis in Table 3 for buys and sells, using a variety of alternative benchmark prices, such as the volume-weighted price excluding large trades (those over a thousand shares or those accounting for more than 30 percent of daily volume), or a randomly selected transaction price from the trade date. The results are qualitatively similar to those using the simple average price as a benchmark, and so are not reported.

[4]There is some evidence that the closing price may not be an entirely representative price for use as a benchmark. Wood, McInish and Ord (1985), Harris (1989) document that returns on the closing transaction are on average positive and relatively large; Harris (1989) also finds an increase in both closing bid and ask prices, as well as an increase in the frequency of ask prices at the close. The day-end pattern in transaction prices may thus account for part of the post-trade price change. However, there is still evidence of a price continuation subsequent to buys and a reversal subsequent to sells when the next-to-closing price is used as the benchmark: the principal-weighted average is 0.09 percent for buys and 0.07 percent for sells.

[5]The reluctance of intermediaries to undertake short positions gives rise to a further possibility. In particular, the pool of counterparties facing a buyer is likely to be more concentrated than the pool of possible counterparties facing a seller. Sellers can thus exploit the potential competition among a larger group of counterparties to obtain a smaller price concession, while buyers have a more limited set of parties on the other side (namely, existing shareholders). As another extension to this argument, it may be the case that existing holders of a stock tend to be more optimistic about its future prospects, relative to other investors. Shleifer and Summers (1990) argue that limitations on arbitrage can lead to differences between the price of a stock and its true value. The buyer of a stock must thus offer a higher premium to induce current holders to part with their shares.

[6]On the other hand, it might be argued that there is a continuous net inflow of funds into institutional accounts, in the form of pension contributions, receipt of dividend and interest income, etc. Buying activity on the part of institutions therefore need not be entirely information-motivated.

[7]Expressing the commission cost relative to the trade price would also confound the effect of commissions with the effect of market capitalization (since smaller stocks tend to have lower prices).

[8]Harris (1990) surveys various methods for measuring execution costs. Hasbrouck (1990), Hasbrouck and Schwartz (1988) develop alternative procedures for inferring execution costs.

References

Admati, Anat and Paul Pfleiderer, 1989, Divide and conquer: A theory of intraday and day-of-the-week mean effects, Review of Financial Studies 2, 189-223.

Amihud, Yakov and Haim Mendelson, 1980, Dealership market: Market-making with inventory, Journal of Financial Economics 8, 31-53.

Asquith, Paul and David Mullins, 1986, Equity issues and offering dilution, Journal of Financial Economics 15, 61-89.

Ball, Ray and Frank Finn, 1989, The effect of block transactions on share prices: Australian evidence, Journal of Banking and Finance 13, 397-419.

Beebower, Gilbert, 1989, Evaluating transaction cost, in Wayne Wagner (ed.), The Complete Guide to Securities Transactions, New York: John Wiley.

Berkowitz, Stephen, Dennis Logue and Eugene Noser, 1988, The total cost of transactions on the NYSE, Journal of Finance 43, 97-112.

Bodurtha, Stephen and Thomas Quinn, 1990, Does patient program trading really pay?, Financial Analysts Journal 46, 35-42.

Brinson, Gary, Brian Singer and Gilbert Beebower, 1991, Determinants of portfolio performance II: An update, Financial Analysts Journal 47, 40-48.

Condon, Kathleen, 1981, Measuring equity transaction costs, Financial Analysts Journal 37, 57-60.

Demsetz, Harold, 1968, The cost of transacting, Quarterly Journal of Economics 82, 32-53.

Easley, David and Maureen O'Hara, 1987, Price, trade size, and information in securities markets, Journal of Financial Economics 19, 69-90.

Fama, Eugene, 1991, Efficient capital markets: II, Journal of Finance (forthcoming).

Glosten, Lawerence, 1989, Insider trading, liquidity, and the role of the monopolist specialist, Journal of Business 62, 211-235.

Harris, Lawrence, 1989, A day-end transaction price anomaly, Journal of Financial and Quantitative Analysis 24, 29-45.

Harris, Lawrence, 1990, Liquidity, trading rules and electronic trading systems, NYU Salamon Center Monograph Series in Finance.

Harris, Lawrence and Eitan Gurel, 1986, Price and volume effects associated with changes in the S&P 500: New evidence for the existence of price pressures, Journal of Finance 41, 815-830.

Hasbrouck, Joel, 1990, Assessing the quality of a security market, working paper, New York University.

Hasbrouck, Joel and Robert Schwartz, 1988, Liquidity and execution costs in equity markets, Journal of Portfolio Management 14, 10-17.

Ho, Thomas and Hans Stoll, 1981, Optimal dealer pricing under transactions and return uncertainty, Journal of Financial Economics 9, 47-73.

Holthausen, Robert, Richard Leftwich and David Mayers, 1987, The effect of large block transactions on security prices: A cross-sectional analysis, Journal of Financial Economics 19, 237-268.

Holthausen, Robert, Richard Leftwich and David Mayers, 1990, Large-block transactions, the speed of response, and temporary and permanent stock-price effects, Journal of Financial Economics 26, 71-95.

Kraus, Alan and Hans Stoll, 1972, Price impacts of block trading on the New York Stock Exchange, Journal of Finance 27, 569-588.

Kyle, Albert, 1985, Continuous auctions and insider trading, Econometrica 53, 1315-1335.

Lakonishok, Josef and Edwin Maberly, 1990, The weekend effect: Trading patterns of individual and institutional investors, Journal of Finance45, 231-243.

Lakonishok, Josef, Andrei Shleifer, Richard Thaler and Robert Vishny, 1991, Window dressing by pension fund managers, American Economic Review Papers and Proceedings 81, 227-231.

Lakonishok, Josef, Andrei Shleifer and Robert Vishny, 1991, Do institutional investors destabilize stock prices? Evidence on herding and feedback trading, working paper, University of Illinois.

Lee, Charles and Mark Ready, 1991, Inferring trade direction from intraday data, Journal of Finance 46, 733-746.

Loderer, Claudio, John Cooney and Leonard Van Drunen, 1991, The price elasticity of demand for common stock, Journal of Finance 46, 621-651.

Loeb, Thomas, 1983, Trading cost: The critical link between investment information and results, Financial Analysts Journal 39, 39-44.

Marshall, Greta, 1988, Execution costs: The plan sponsor's view, in Katrina Sherrerd (ed.), Trading Strategies and Execution Costs, Institute of Chartered Financial Analysts.

Mikkelson, Wayne and Megan Partch, 1985, Stock price effects and costs of secondary distributions, Journal of Financial Economics 14, 165-194.

Perold, André, 1988, The implementation shortfall: Paper versus reality, Journal of Portfolio Management 14, 4-9.

Scholes, Myron, 1972, The market for securities: Substitution versus price pressure and the effects of information on share prices, Journal of Business 45, 179-211.

Schwartz, Robert, 1991, Institutionalization of the equity markets, Journal of Portfolio Management 17, 44-49.

Schwartz, Robert and James Shapiro, 1990, The challenge of institutionalization for the equity markets, working paper, New York University.

Schwartz, Robert and David Whitcomb, 1988, Transaction costs and institutional investor trading strategies, NYU Salomon Center Monograph Series in France.

Shleifer, Andrei, 1986, Do demand curves for stocks slope down?, Journal of Finance 41, 579-590.

Shleifer, Andrei and Lawrence Summers, 1990, The noise trader approach to finance, Journal of Economic Perspectives 4, 19-33.

Stoll, Hans, 1991, Equity trading costs in the large and in the small, working paper, Vanderbilt University.

Stoll, Hans and Robert Whaley, 1983, Transaction costs and the small firm effect, Journal of Financial Economics 12, 57-80.

Treynor, Jack, 1981, What does it take to win the trading game?, Financial Analysts Journal 37, 55-60.

Wagner, Wayne, 1989, A taxonomy of trading techniques, in Wayne Wagner (ed.), The Complete Guide to Securities Transactions, New York: John Wiley.

Wood, Robert, Thomas McInish and J. Keith Ord, 1985, An investigation of transactions data for NYSE stocks, Journal of Finance 40, 723-739.

Table 1

Sample Characteristics

Panel A reports the number of trades and dollar value traded (in parentheses) in each size group for buys and sells. Number of trades is in thousands, while dollar value traded is in billions of dollars. Size is measured as market value of outstanding equity at the end of each quarter. Four groups are defined, based on the percentiles of the size distribution of all NYSE and AMEX stocks. Group 1 comprises firms in the smallest 40 percent of firms by size; group 2 comprises firms in the next 40 percent; group 3 comprises firms in the ninth decile; group 4 comprises firms in the top decile of firms. Panel B reports the distribution of buys and sells (in parentheses) by the number of shares traded and percent of total principal.

Panel A

	1 (small)		2		3		4 (large)		Total	
	Trades	($ value)	Trades	($ value)	Trades	($ value)	Trades	($ value)	Trades	($ value)
Buys	28.7	($1.3B)	167.8	($32.3B)	138.0	($42.2B)	301.1	($117.7B)	635.6	($193.5B)
Sells	17.2	($1.2B)	147.7	($31.5B)	127.2	($41.2B)	287.7	($120.2B)	579.8	($194.1B)
Total	45.9	($2.5B)	315.5	($63.8B)	265.2	($83.4B)	588.8	($237.9B)	1,233.4	($387.6B)

Panel B

# shares traded (in thousands)	% of observations		cumulative % of observations		% of principal		cumulative % of principal	
0 - 2	44	(42)	44	(42)	4	(4)	4	(4)
2 - 5	20	(19)	64	(61)	8	(7)	12	(11)
5 - 10	13	(15)	77	(76)	11	(11)	23	(22)
10 - 20	12	(12)	89	(88)	19	(19)	42	(41)
20 - 30	5	(5)	94	(93)	14	(13)	56	(54)
30 - 50	3	(3)	97	(96)	13	(13)	69	(67)
50 +	3	(4)	100	(100)	31	(33)	100	(100)

Table 2

Distribution of Trade Statistics for Buys and Sells

The distribution of transaction statistics is reported for all trades and by size for buys and sells. The numbers in parentheses are the statistics for sells. Panel A presents statistics for the number of shares traded (in thousands), Panel B reports statistics for the dollar value of a trade (in thousands of $), and Panel C shows the trade size relative to normal daily volume. Normal daily volume is computed as the average daily volume over a prior 40 day interval.

Panel A: Shares Traded

	All		1 (small)		2		3		4 (large)	
Mean	8.4	(9.1)	4.7	(7.7)	8.6	(9.6)	9.3	(9.7)	8.2	(8.7)
Standard Deviation	20.9	(24.3)	11.4	(22.3)	20.3	(26.8)	23.8	(25.0)	20.5	(22.6)
Median	2.4	(2.7)	1.8	(2.9)	3.0	(3.5)	2.6	(3.0)	2.0	(2.1)
10%	0.2	(0.3)	0.2	(0.4)	0.3	(0.4)	0.3	(0.3)	0.2	(0.2)
25%	0.7	(0.8)	0.6	(1.0)	1.0	(1.0)	0.8	(0.9)	0.6	(0.6)
75%	8.5	(9.4)	4.9	(7.5)	10.0	(10.0)	10.0	(10.0)	7.6	(8.0)
90%	20.0	(20.0)	10.0	(15.5)	20.0	(20.0)	21.1	(21.7)	20.0	(20.0)
95%	32.5	(34.7)	18.2	(27.2)	31.3	(35.4)	38.0	(39.7)	34.0	(35.8)
99%	91.7	(100.0)	50.0	(86.1)	87.2	(100.0)	100.0	(100.0)	100.0	(100.0)

Panel B: Dollar Value of Trade (thousand $)

	All		1 (small)		2		3		4 (large)	
Mean	304	(335)	44	(68)	192	(213)	306	(323)	391	(417)
Standard Deviation	763	(862)	111	(198)	430	(517)	707	(791)	936	(1031)
Median	79	(94)	16	(25)	67	(76)	89	(103)	100	(112)
10%	8	(10)	2	(3)	7	(9)	9	(11)	11	(12)
25%	23	(27)	6	(9)	20	(23)	25	(30)	29	(31)
75%	275	(300)	41	(66)	196	(209)	303	(318)	357	(379)
90%	730	(777)	95	(145)	462	(480)	784	(752)	962	(998)
95%	1234	(1365)	162	(241)	751	(809)	1250	(1275)	1672	(1756)
99%	3159	(3666)	444	(700)	1892	(2182)	3163	(3387)	4313	(4721)

Panel C: Trade Size Relative to Normal Trading Volume

	All		1 (small)		2		3		4 (large)	
Mean	0.11	(0.12)	0.61	(0.75)	0.21	(0.25)	0.08	(0.08)	0.03	(0.03)
Standard Deviation	0.54	(0.65)	1.75	(2.49)	0.59	(0.88)	0.41	(0.26)	0.10	(0.11)
Median	0.02	(0.02)	0.24	(0.26)	0.07	(0.08)	0.02	(0.02)	0.01	(0.01)
10%	0.00	(0.00)	0.03	(0.03)	0.01	(0.01)	0.00	(0.00)	0.00	(0.00)
25%	0.00	(0.00)	0.09	(0.09)	0.02	(0.02)	0.01	(0.01)	0.00	(0.00)
75%	0.08	(0.08)	0.58	(0.69)	0.21	(0.22)	0.07	(0.08)	0.02	(0.02)
90%	0.26	(0.24)	1.27	(1.55)	0.50	(0.54)	0.19	(0.19)	0.07	(0.07)
95%	0.42	(0.44)	2.09	(2.55)	0.81	(0.92)	0.32	(0.32)	0.12	(0.13)
99%	1.11	(1.27)	5.73	(7.62)	2.11	(2.63)	0.79	(0.85)	0.34	(0.38)

Table 3

Summary statistics for price impact and commission cost for institutional purchases (Panel A) and institutional sales (Panel B). Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	Return (in percent) from:						
	Opening Price to trade	Trade to Closing Price	Opening to Closing	Same Day Volume-Weighted Price to trade	Same Day Volume-Weighted Price Excluding Trade, to trade	Same Day Average Price to trade	Commission Cost, %
			Panel A: Buys				
Average by principal	0.22	0.12	0.34	0.02	0.03	0.02	0.17
Mean	0.10	0.16	0.26	-0.01	-0.01	-0.03	0.23
Standard deviation	1.46	1.39	2.02	0.81	0.91	0.85	0.25
Proportion > 0	0.44	0.38	0.48	0.49	0.50	0.50	0.99
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.17
10-percentile	-1.33	-1.20	-1.85	-0.78	-0.85	-0.86	0.07
25-percentile	-0.49	-0.44	-0.78	-0.31	-0.33	-0.35	0.11
75-percentile	0.68	0.71	1.22	0.30	0.33	0.34	0.26
90-percentile	1.61	1.61	2.60	0.75	0.83	0.80	0.43
			Panel B: Sells				
Average by principal	-0.14	0.10	-0.04	-0.07	-0.09	-0.10	0.17
Mean	-0.06	0.08	0.02	-0.05	-0.06	-0.07	0.23
Standard deviation	1.52	1.44	2.05	0.86	0.94	-0.89	0.25
Proportion < 0	0.45	0.46	0.46	0.54	0.54	0.55	0.00
Median	0.00	0.00	0.00	-0.04	-0.05	-0.06	0.17
10-percentile	-1.56	-1.35	-2.10	-0.86	-0.94	-0.93	0.07
25-percentile	-0.69	-0.52	-1.01	-0.38	-0.42	-0.42	0.11
75-percentile	0.50	0.67	1.00	0.28	0.30	0.31	0.26
90-percentile	1.42	1.55	2.30	0.75	0.81	0.78	0.42

Table 4A

Principal-weighted average, simple average and median for price impact and commission cost for institutional purchases, classified by market value of outstanding equity at end of prior quarter. Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	Return (in %) from:						
	Opening Price to trade	Trade to Closing Price	Opening to Closing	Same Day Volume-Weighted Price to trade	Same Day Volume-Weighted Price Excluding Trade, to trade	Same Day Average Price to trade	Commission Cost, %
(a) Smallest firms (1% of total principal; average price = $9.3)							
Average by principal	0.10	0.39	0.49	-0.08	-0.05	-0.18	0.60
Mean	-0.16	0.37	0.21	-0.19	-0.24	-0.25	0.83
Median	0.00	0.00	0.00	-0.02	-0.08	-0.08	0.67
(b) Size group 2 (17% of total principal; average price = $22.4)							
Average by principal	0.32	0.22	0.54	0.01	0.03	-0.01	0.26
Mean	0.18	0.23	0.41	-0.02	-0.01	-0.04	0.32
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.25
(c) Size group 3 (22% of total principal; average price = $33.9)							
Average by principal	0.24	0.12	0.36	0.03	0.04	0.02	0.18
Mean	0.10	0.16	0.26	-0.01	-0.00	-0.02	0.20
Median	0.00	0.00	0.00	-0.00	-0.00	0.01	0.17
(d) Largest firms (61% of total principal; average price = $48.9)							
Average by principal	0.19	0.09	0.28	0.03	0.03	0.03	0.13
Mean	0.08	0.09	0.17	0.00	0.00	0.00	0.15
Median	0.00	0.00	0.00	0.01	0.01	0.02	0.13

Table 4B

Principal-weighted average, simple average and median for price impact and commission cost, for institutional sales, classified by market value of outstanding equity at end of prior quarter. Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	Return (in %) from:						
	Opening Price to trade	Trade to Closing Price	Opening to Closing	Same Day Volume-Weighted Price to trade	Same Day Volume-Weighted Price Excluding Trade, to trade	Same Day Average Price to trade	Commission Cost, %
(a) Smallest firms (1% of total principal; average price = $8.5)							
Average by principal	-0.57	0.46	-0.11	-0.12	-0.35	-0.42	0.57
Mean	-0.37	0.08	-0.29	0.01	-0.07	-0.16	0.77
Median	0.00	0.00	0.00	-0.01	-0.03	-0.07	0.58
(b) Size group 2 (16% of total principal; average price = $22.5)							
Average by principal	-0.17	0.20	0.03	-0.08	-0.15	-0.16	0.26
Mean	-0.12	0.12	0.00	-0.06	-0.08	-0.10	0.32
Median	0.00	0.00	0.00	-0.03	-0.05	-0.08	0.25
(c) Size group 3 (21% of total principal; average price = $34.2)							
Average by principal	-0.14	0.12	-0.02	-0.06	-0.10	-0.11	0.19
Mean	-0.03	0.08	0.05	-0.04	-0.05	-0.05	0.21
Median	0.00	0.00	0.00	-0.04	-0.04	-0.06	0.17
(d) Largest firms (62% of total principal; average price = $49.2)							
Average by principal	-0.12	0.06	-0.06	-0.06	-0.08	-0.07	0.14
Mean	-0.03	0.06	0.03	-0.05	-0.05	-0.05	0.16
Median	0.00	0.00	0.00	-0.05	-0.05	-0.05	0.13

Principal-weighted average, simple average and median for price impact and commission cost, for institutional purchases, classified by complexity (trade principal value relative to normal daily volume).* Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	Return (in %) from:						
	Opening Price to trade	Trade to Closing Price	Opening to Closing	Same Day Volume-Weighted Price to trade	Same Day Volume-Weighted Price Excluding Trade, to trade	Same Day Average Price to trade	Commission Cost, %
(a) Hardest (9% of total principal; average price = $26.0)							
Average by principal	0.29	0.22	0.51	0.01	0.05	-0.02	0.22
Mean	0.26	0.29	0.55	-0.02	0.03	-0.07	0.43
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.29
(b) Complexity group 4 (11% of total principal; average price = $31.3)							
Average by principal	0.32	0.15	0.47	0.03	0.05	0.02	0.21
Mean	0.26	0.20	0.46	0.01	0.03	-0.01	0.38
Median	0.00	0.00	0.00	0.00	0.01	0.00	0.26
(c) Complexity group 3 (10% of total principal; average price = $33.4)							
Average by principal	0.31	0.13	0.44	0.04	0.05	0.04	0.19
Mean	0.24	0.17	0.41	0.01	0.02	-0.00	0.34
Median	0.00	0.00	0.00	0.00	0.01	0.00	0.24
(d) Complexity group 2 (24% of total principal; average price = $37.0)							
Average by principal	0.27	0.11	0.38	0.04	0.05	0.03	0.17
Mean	0.18	0.18	0.36	-0.00	-0.00	-0.02	0.30
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.21
(e) Easiest (46% of total principal; average price = $43.9)							
Average by principal	0.14	0.09	0.23	0.02	0.02	0.01	0.14
Mean	0.07	0.14	0.21	-0.02	-0.02	-0.02	0.21
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.15

*Normal daily volume is measured as the average daily trading volume in the stock over a 40-day period prior to the trade date. Trades accounting for more than 80 percent of normal volume are in the category of the hardest trades; group 4 comprises trades between 40 percent and 80 percent of normal volume; group 3 comprises trades between 25 percent and 40 percent of normal volume, group 2 comprises trades between 10 percent and 25 percent of normal volume; trades accounting for less than 10 percent of normal volume are in the category of the easiest trades.

Principal-weighted average, simple average and median for price impact and commission cost, for institutional sales, classified by complexity (trade principal value relative to normal daily volume).* Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	Return (in %) from:						
	Opening Price to trade	Trade to Closing Price	Opening to Closing	Same Day Volume-Weighted Price to trade	Volume-Weighted Price Excluding Trade, to trade	Same Day Average Price to trade	Commission Cost, %
(a) Hardest (9% of total principal; average price = $26.0)							
Average by principal	-0.37	0.22	-0.15	-0.10	-0.25	-0.24	0.23
Mean	-0.25	0.34	0.09	-0.10	-0.15	-0.27	0.39
Median	0.00	0.00	0.00	-0.04	-0.10	-0.14	0.28
(b) Complexity group 4 (11% of total principal; average price = $31.9)							
Average by principal	-0.24	0.14	-0.10	-0.09	-0.15	-0.14	0.21
Mean	-0.23	0.18	-0.05	-0.10	-0.18	-0.19	0.34
Median	0.00	0.00	0.00	-0.04	-0.08	-0.11	0.25
(c) Complexity group 3 (10% of total principal; average price = $34.4)							
Average by principal	-0.17	0.11	-0.06	-0.08	-0.11	-0.12	0.19
Mean	-0.19	0.17	-0.02	-0.09	-0.13	-0.15	0.32
Median	0.00	0.00	0.00	-0.05	-0.07	-0.09	0.23
(d) Complexity group 2 (23% of total principal; average price = $37.4)							
Average by principal	-0.14	0.09	-0.05	-0.06	-0.08	-0.08	0.17
Mean	-0.14	0.11	-0.03	-0.06	-0.08	-0.10	0.28
Median	0.00	0.00	0.00	-0.04	-0.05	-0.07	0.21
(e) Easiest (47% of total principal; average price = $45.1)							
Average by principal	-0.05	0.06	0.01	-0.05	-0.05	-0.05	0.14
Mean	-0.03	0.06	0.03	-0.04	-0.04	-0.05	0.21
Median	0.00	0.00	0.00	-0.04	-0.04	-0.05	0.16

*Normal daily volume is measured as the average daily trading volume in the stock over a 40-day period prior to the trade date. Trades accounting for more than 80 percent of normal volume are in the category of the hardest trades; group 4 comprises trades between 40 percent and 80 percent of normal volume; group 3 comprises trades between 25 percent and 40 percent of normal volume, group 2 comprises trades between 10 percent and 25 percent of normal volume; trades accounting for less than 10 percent of normal volume are in the category of the easiest trades.

Table 6

Principal-weighted average price impact for institutional purchases and sales (in parentheses), classified by market value of outstanding equity at end of prior quarter, and complexity (trade principal value relative to average daily volume over a prior 40 day period). Price impact is measured as the return: from the opening price to the trade; from the trade to the closing price; from the opening to the closing; and from the volume-weighted price to the trade. Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

Return (in %) from:	Smallest Firms		Size Group 2		Size Group 3		Largest Firms	
(a) Hardest								
Opening price to trade	0.23	(-0.57)	0.37	(-0.21)	0.28	(-0.19)	0.22	(-0.16)
Trade to closing price	0.49	(0.71)	0.27	(0.26)	0.13	(0.16)	0.11	(0.08)
Opening to closing	0.72	(0.14)	0.64	(0.05)	0.41	(-0.03)	0.33	(-0.08)
Volume-weighted price to trade	-0.08	(-0.18)	0.01	(-0.09)	0.03	(-0.07)	0.04	(-0.07)
(b) Complexity group 3								
Opening price to trade	0.08	(-0.56)	0.28	(-0.12)	0.13	(-0.01)	0.10	(-0.02)
Trade to closing price	0.30	(0.24)	0.21	(0.17)	0.14	(0.09)	0.08	(0.06)
Opening to closing	0.38	(-0.32)	0.49	(0.05)	0.27	(0.08)	0.18	(0.04)
Volume-weighted price to trade	-0.03	(-0.06)	0.02	(-0.07)	0.02	(-0.04)	0.01	(-0.04)
(c) Complexity group 2								
Opening price to trade	-0.20	(-0.62)	0.15	(-0.08)	0.07	(0.03)	0.05	(0.01)
Trade to closing price	0.38	(0.15)	0.20	(0.14)	0.17	(0.07)	0.10	(0.02)
Opening to closing	0.18	(-0.47)	0.35	(0.06)	0.24	(0.10)	0.15	(0.03)
Volume-weighted price to trade	-0.14	(-0.05)	-0.01	(-0.06)	-0.01	(-0.03)	-0.01	(-0.03)
(d) Easiest								
Opening price to trade	-0.58	(-0.48)	0.06	(0.00)	0.02	(0.01)	0.03	(0.01)
Trade to closing price	0.48	(-0.16)	0.22	(0.14)	0.20	(0.03)	0.08	(0.04)
Opening to closing	-0.10	(-0.64)	0.28	(0.14)	0.22	(0.04)	0.11	(0.05)
Volume-weighted price to trade	-0.27	(0.21)	-0.05	(-0.03)	-0.04	(-0.01)	-0.02	(-0.03)

Table 7

Summary statistics for distribution across managers of measures of price impact, of buys and sells (in parentheses) based on principal-weighted averages across trades of each of 37 institutional money management firms. Price impact is the return (in percent): from the opening price to the trade, from the trade to the closing price, and from the opening to closing. Sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	Return (in percent) from:					
	Opening price to trade		Trade to closing price		Opening to closing	
Average by principal	0.22	(-0.14)	0.12	(0.10)	0.34	(-0.04)
Mean	0.13	(-0.04)	0.12	(0.12)	0.24	(0.08)
Standard deviation	0.45	(0.37)	0.13	(0.09)	0.42	(0.42)
Median	0.20	(-0.09)	0.13	(0.11)	0.32	(0.04)
10-percentile	-0.46	(-0.46)	-0.01	(0.01)	-0.39	(-0.36)
25-percentile	0.01	(-0.31)	0.04	(0.05)	0.04	(-0.22)
75-percentile	0.37	(0.14)	0.17	(0.15)	0.53	(0.27)
90-percentile	0.54	(0.52)	0.25	(0.26)	0.75	(0.78)
Range between 10 and 90 percentiles	1.00	(0.98)	0.26	(0.27)	1.14	(1.14)

Table 8

Regression estimates of the model,

$$r_i = \alpha + \beta C_i + \sum_{j=1}^{3} \delta_j S_{ij} + \sum_{j=1}^{4} \gamma_j D_{ij} + \sum_{j=1}^{36} \varphi_j M_{ij} + \varepsilon_i$$

where r_i is the return (in %) from: the open to the trade, from the trade to the close, and from the open to the close. C_i is the dollar commission cost; S_{ij} is a dummy variable for the trade's classification by market capitalization; D_{ij} is a dummy variable for the trade's classification by complexity; M_{ij} is a dummy variable for the money manager. The equation is estimated separately for buys and for sells. The sample comprises all trades of NYSE and AMEX stocks made by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

A. Adjusted R^2 (in percent) for full model, and models with each set of dummy variables excluded one set at a time. Results from the equation for sells are in parentheses.

	Return (in %) from:					
	Opening price to trade		Trade to Closing price		Opening to closing	
Full model	3.45	(3.36)	0.70	(0.53)	1.74	(1.39)
Excluding manager effects	0.43	(0.26)	0.35	(0.17)	0.36	(0.10)
Excluding size effects	3.45	(3.31)	0.48	(0.51)	1.61	(1.34)
Excluding complexity effects	3.33	(3.34)	0.70	(0.42)	1.70	(1.38)

B. Estimated efficients for full model for buys and for sells (in parentheses)

	Return (in %) from:					
Explanatory variable	Opening price to trade		Trade to Closing price		Opening to closing	
Intercept	0.17	(-0.32)	0.00	(0.15)	0.18	(-0.18)
Commission	0.00	(-0.00)	-0.00	(-0.01)	-0.00	(-0.01)
Size 1 (smallest)	0.01	(-0.21)	0.30	(-0.07)	0.30	(-0.28)
2	0.02	(-0.04)	0.16	(-0.04)	0.18	(-0.01)
3 (large)	-0.00	(-0.00)	0.07	(0.01)	0.07	(0.01)
Complexity 2 (easy)	0.08	(-0.03)	-0.02	(0.05)	0.06	(0.02)
3	0.15	(-0.07)	-0.06	(0.12)	0.10	(0.05)
4	0.20	(-0.09)	-0.05	(0.13)	0.15	(0.04)
5 (hardest)	0.22	(-0.11)	-0.00	(0.29)	0.22	(0.17)
Manager						
10-percentile	-0.52	(-0.15)	0.00	(-0.34)	-0.41	(-0.33)
25-percentile	-0.25	(-0.04)	0.07	(-0.26)	-0.14	(-0.19)
Median	-0.12	(0.15)	0.12	(-0.18)	0.01	(0.03)
75-percentile	0.03	(0.44)	0.22	(-0.09)	0.20	(0.22)
90-percentile	0.20	(0.70)	0.26	(0.00)	0.28	(0.54)
Range between 10 and 90 percentiles	0.72	(0.85)	0.26	(0.34)	0.69	(0.87)

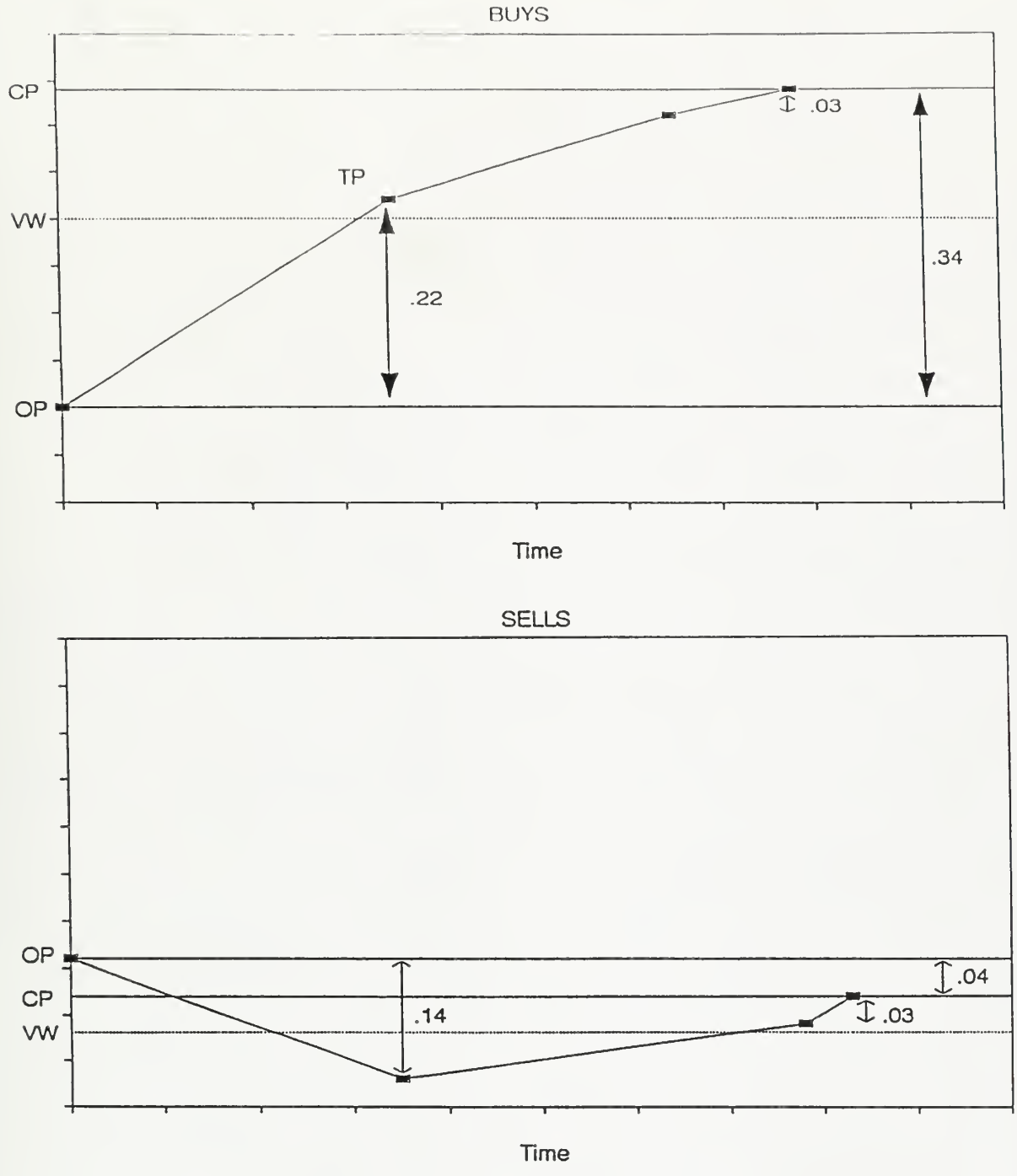

Figure 1. Principal-weighted average differences (in percent) between trade price (TP) and opening price (OP), closing price (CP), and volume-weighted average price (VW) for institutional purchases and sales.